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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Policies, Procedures, and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769	Rulemaking 14-08-013 (Filed August 14, 2014)

REPLY OF VARENTEC TO RESPONSES ON ORDER INSTITUTING RULEMAKING

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Consistent with the *Order Instituting Rulemaking* issued on August 14, 2014, Varentec respectfully submits the following reply comments and responses to questions raised. Varentec is delighted to participate in the scope of discussions outlined in this proceeding and believe that our direct experience in delivering advanced grid voltage control solutions will offer a meaningful contribution to the record being developed.

I. INTRODUCTION

Varentec is pleased to submit these reply comments to responses offered by parties to the set of questions outlined in the *Order Instituting Rulemaking*. Varentec builds decentralized solutions that directly address key challenges facing the electric utility industry today, including:

1) **Renewable Energy (PV) Integration** and management of the voltage and load impacts on feeder circuits;
2) **Volt VAR Control (VVC)** including methodology, planning and operations support;
3) **Peak Demand Reduction & Conservation Voltage Reduction (CVR)**

delivering energy efficiency and peak demand reduction benefits; and,

4) **Voltage Compliance** especially in situations where AMI data are revealing low-voltage pockets.

Varentec strongly supports the overall objective established by AB 327 and furthered by the Commission in this proceeding to identify the "optimal location for the deployment of DERs, and [the] specific locational values for DERs." Clearly, we believe that identifying these specific locations challenges and values will highlight opportunities to optimizing the voltage characteristics of the distribution grid, improving overall operations and advancing policy objectives related to integration of distributed energy resources.

Varentec's ENGO-V10 product provides decentralized grid control and is currently in active deployment with utilities nationwide. As of July 2014, over 400 units have been installed, including over 90 on a single feeder. Our replies to the previous responses and to the questions posed draw from our direct operational experience.

We are eager to contribute to the discussions in this proceeding.

II. GENERAL REMARKS

We echo many party responses that highlighted the importance of considering voltage impacts and characteristics in developing Distributed Resource Plans (DRP's), including the responses of the Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric, California ISO, Environmental Defense Fund, Vote Solar Clean Coalition and several others. We wholeheartedly agree that voltage management and impacts is a criterion that applies across many aspects of the anticipated DRP's. We encourage the Commission to provide guidance to utilities that a full exploration of the existing voltage characteristics, challenges and proposed solutions is warranted within the scope of the DRP's.

New technologies, particularly distributed renewable energy systems and rooftop photovoltaics, are introducing new challenges and issues for the management and operation of the distribution system. Many of these challenges can be directly addressed with "grid edge" voltage solutions. For example, AMI data reveal that voltage fluctuations along distribution feeder lines are more dramatic than previously understood. Similarly, distributed energy resource (especially rooftop solar) introduce new voltage management challenges, especially with regard to voltage fluctuations on cloudy days as well as over-voltage situations not previously well understood.

"Grid Edge" voltage management is demonstrated to be an extremely effective strategy for both (1) mitigating impacts of new distributed energy technologies and (2) achieving system-wide efficiencies from voltage reductions. Additional benefits include extension of asset life and optimization of system utilization.

Further, Varentec encourages the Commission to include guidance that DRP's should consider both traditional and innovative voltage solutions and favor solutions that provide support to multiple policy and operational objectives. Varentec provides a "grid edge control layer" that complements existing Volt VAR Optimization (VVO) strategies and delivers cross-cutting benefits to grid operations.

Establishing a distributed grid edge voltage solution provides decentralized autonomous control with a fast, coordinated response that allows surgical deployment of voltage regulation and improves both the local and system voltage profiles. A distributed, decentralized control strategy enables wide range of benefits including ensuring voltage compliance, enhancing PV integration, delivering dynamic VARs, establishing grid visibility, enhancing power factor and enabling energy efficiency and load management through voltage reductions.

In general, the technology and field experience of Varentec demonstrate that voltage control and optimization provides tangible, quantifiable benefits that can dramatically reduce the costs associated with system operations and distributed energy policy objectives. While we offer selected brief responses to questions raised by the *Order Instituting Rulemaking,* we believe that any comprehensive analysis of the distribution system must include consideration of voltage management.

Therefore, we encourage the Commission to provide guidance in this proceeding that incorporates voltage management in all aspects of the DRP's to be delivered. Guidance from the Commission to utilities regarding the upcoming DRP's should include requirements to include baseline analysis of voltage issues within the distribution system and identification of the costs and capabilities of various voltage management solutions. Preference should be given to solutions that allow the most effective integration of expected distributed energy resources in the years ahead.

III. SPECIFIC RESPONSES

1) What specific criteria should the Commission consider to guide the IOUs' development of DRPs, including what characteristics, requirements and specifications are necessary to enable a distribution grid that is at once reliable, safe, resilient, cost-efficient, open to distributed energy resources, and enables the achievement of California's energy and climate goals?

As stated, we echo the comments of parties that propose that voltage be considered a key criterion in the development of DRPs. Specifically, we propose that DRPs include analysis of the voltage characteristics of the distribution system at a sufficient level of detail to identify the size, scope, time scale, geospacial nature of voltage issues being observed in order to assess voltage management needs and opportunities. We presume this entails analysis at the feeder circuit level.

We agree with utility responses that also highlight voltage management as a key criterion. For example, Southern California Edison notes that voltage, amperage, KW, KVA, and data relating to functionality and performance should be included as data considered in DRPs, and they also have stated that system response to grid issues need to increase in speed by one to two orders of magnitude compared to what existing systems currently deliver

Further, we encourage the Commission to establish guidance that system information should be provided in consistent manner for each utility, allowing the development of a statewide view of the distribution system.

3) What specific criteria should be considered in the development of a calculation methodology for optimal locations of DERs?

4) What specific values should be considered in the development of a locational value of DER calculus? What is optimal means of compensating DERs for this value?

5) What specific considerations and methods should be considered to support the integration of DERs into IOU distribution planning and operations?

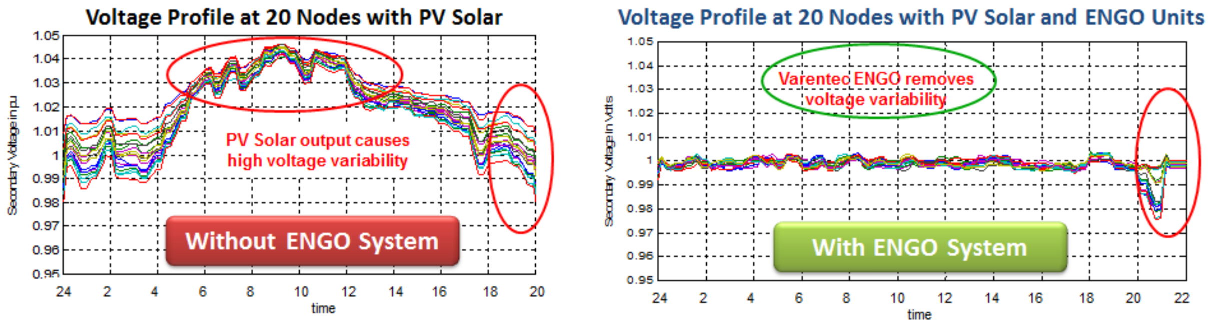
6) What specific distribution planning and operations methods should be considered to support the provision of distribution reliability services by DERs?

Voltage management is a criterion that should be include in DRPs and, more specifically, incorporated into the development of locational value methodologies and values. As noted by at least one party (Environmental Defense), calculation of locational value should include reductions in capital investment and operating costs that may be avoided by management of voltage, reactive power and power flow issues.

Grid-side Demand Management, as compared to customer-side Demand Management (such as demand desponse solutions) should be assessed on a dollar-per-kW peak reduction basis (for peak demand reduction goals) as well as dollar per-kWh reduced (for energy efficiency and continuous demand reduction goals).

If IOUs are simultaneously aiming to optimize feeders for efficiency and demand management, and optimize for DER integration, specific considerations need to take into account these programs interact and affect each other. Consideration should be given to technologies that will allow both approaches to be employed simultaneously in a complementary, and not adverse, fashion. For example, solar photovoltaic systems can increase the uncertainty of voltage at a location, at any given time of day, due to intermittency. Yet, volt-VAR optimization or CVR (Conservation Voltage Reduction) efforts in use in California for decades rely upon reasonably predictable voltage. These programs typically rely on setting the substation voltage at the lowest level for energy conservation (either for a peak event or for continuous energy conservation) while not causing the voltage for any individual consumers along the feeder to drop too low (i.e., below grid voltage standards such as -5% from nominal). But solar photovoltaic voltage intermittency can reduce consistency and predictability of voltage and therefore can cause voltage variations on a minute-by-minute basis and prevent VVO or CVR strategies from being able to establish stable voltage levels along a feeder.

Technologies like Varentec's distributed, FAST Voltage VAR regulators solve this opposing problem by stabilizing and smoothing out voltage all along the feeder and at points of voltage volatility (such as solar photovoltaic installations on roofs or at commercial sites). This approach (and others like it) can restore voltage stability needed by VVO, CVR and Peak Demand Reduction strategies. In fact, data from field installations shown below reveals that the Varentec technology provides such a strong smoothing effect all along the feeder and provides visibility to that consistent voltage to grid operators that IOUs can now achieve voltage reductions double those of historic levels of CVR or Peak Reductions. This can deliver twice the value to California energy customers and bolster the ability to absorb solar photovoltaic systems onto the distribution grids within California.



7) What types of benefits should be considered when quantifying the value of DER integration in distribution system planning and operations?

We agree with several parties that highlighted that voltage management can enhance overall penetration of DERs. Vote Solar, for example, highlighted that distribution line voltage, distance to load and proximity to sub-stations are relevant criteria when considering the overall and strategic integration of DER. We agree that improving voltage management capabilities can dramatically increase the penetration of clean, distributed energy by immediately and directly mitigating the voltage impacts these systems may have on the distribution system. As noted by Vote Solar, "advanced inverter, voltage-regulation equipment, energy management systems and energy storage can avoid expensive upgrades and are beneficial to the system." We wholeheartedly agree.

It should also be noted that advanced, grid edge voltage management is compatible with and complementary to smart inverter deployment. We offer the following simple chart as a summation of the benefits that can accrue from deploying advanced grid optimization strategies:

Application	Value Proposition	Drivers	Benefits
Grid Support	Improved Reliability	Utility Compliance	Mitigation of low-voltage pockets and improve reliability
	PV Solar Dynamics Mitigation	RPS Compliance	Dynamic VARs can help mitigate voltage volatility from PV Solar
	Voltage Dynamics Mitigation	Utility Compliance	Dynamic voltage support for voltage momentaries and sag events
	Feeder VVO Analytics	O&M Reduction	Secondary side visibility and feeder level analytics
Grid Optimization	Maximum Demand Reduction	Demand Management	Fix low voltage nodes, allowing lowering of peak demand
	Lost Revenue Recovery	Revenue	Fix low voltage areas which normalizes revenue to typical rate
	Peak Load / Gen Reduction	Opex Savings	Reduction of peak generation costs with no customer involvement
	Line Loss Reduction	Opex Savings	Dispatch VARs to optimize feeders for minimum losses
	Extend Life of Primary Assets	O&M Reduction	Reduce LTC/LVR/cap bank operation for longer asset life
Grid Control	Enhanced Network Support	Generation Capacity	Frees generation capacity, reduces operating cost

9) What types of data and level of data access should be considered as part of the DRP?

Because voltage characteristics vary according to the specific operational profiles of distribution feeder circuits, data must be provided at a sufficiently detailed level to support development of an effective and comprehensive voltage management solution. We believe this level of detail will go beyond the traditional publicly available information about voltage profiles.

10) Should the DRPs include specific measures or projects that serve to demonstrate how specific types of DER can be integrated into distribution planning and operation? If so, what are some examples that IOUs should consider?

Specific measures can include deployment of advanced grid management solutions to immediately address critical needs that are identified through the DRP process. As demonstrated by field deployments, voltage reductions of 5%, along with other benefits, are achievable by implementing grid edge control systems. Appendix A provides information drawn from existing field deployments of Varentec technology.

We welcome the opportunity to provide more detailed information through the technical conferences, workshops and further comments anticipated in this proceeding.

IV. CONCLUSION

Voltage management is a fundamental component of distributed resource planning. We encourage the Commission to provide guidance in this proceeding that incorporates voltage management in all aspects of the DRP's to be delivered. In order to fully assess the locational value of distributed energy resources, it is imperative that voltage information is considered and made available in a consistent, usable format.

Thank you for the opportunity to offer these comments and we look forward to being part of the discussion going forward.

September 29, 2014 in San Jose, California.

Respectfully Submitted,

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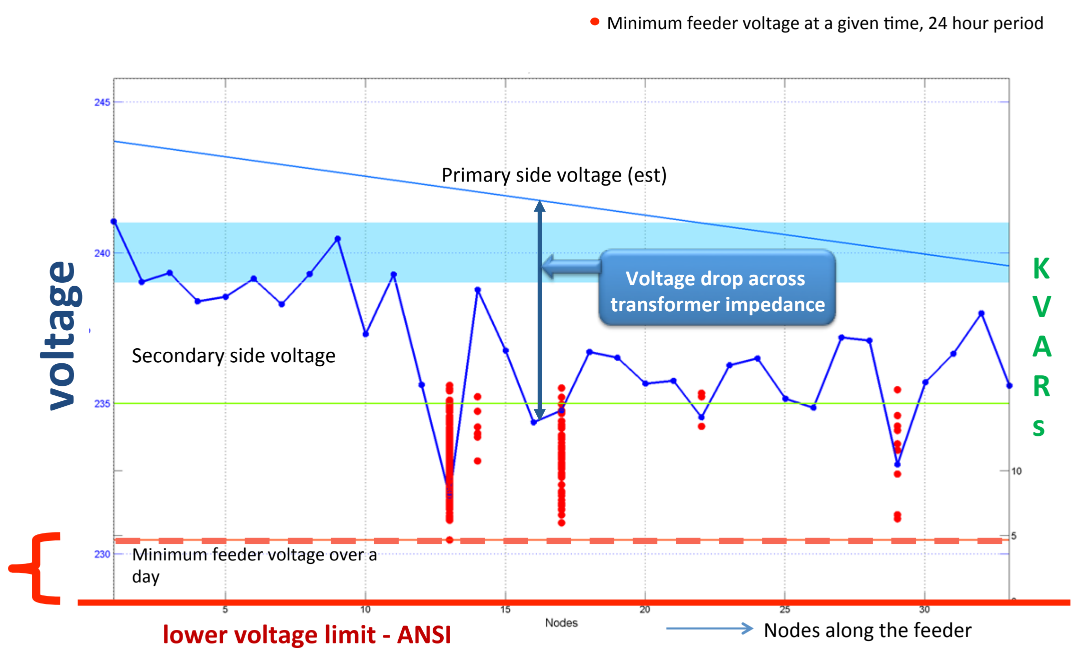
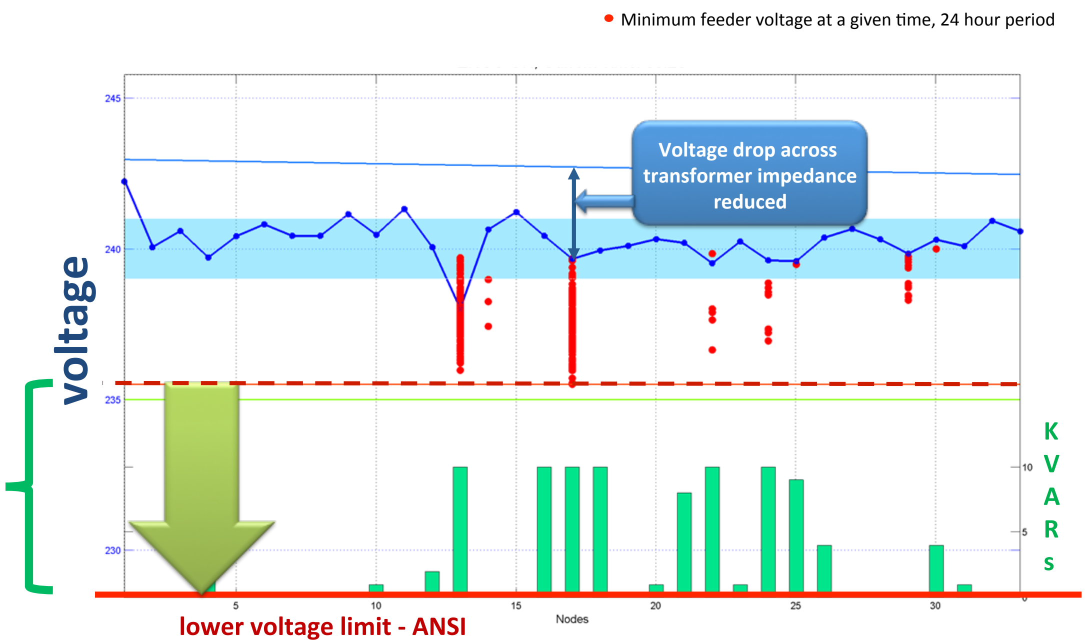
APPENDIX A: Field deployment results

Varentec's ENGO solution has demonstrated, through field deployment in real operational settings, the capability of reducing voltage by as much as 5%, yielding tremendous energy efficiency and operational benefits. Simultaneously, these deployments allow for over-voltage conditions arising from distributed energy facilities to be managed, demonstrating that advanced voltage management solutions can address specific needs at both the upper and lower ranges of ANSI voltage requirements.

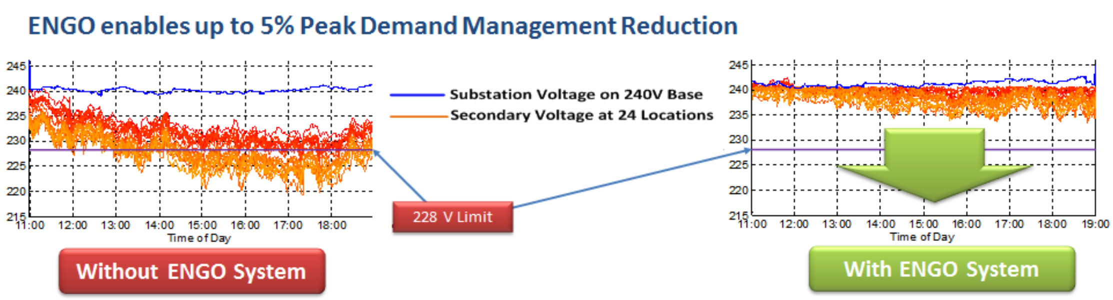
1. No Voltage Control: The following chart shows the voltage levels at different points along the feeder line. Note that there are several locations with significantly low voltage levels:



2. With Grid Edge Control: The following chart show the same feeder line with grid edge control deployed. Note that the previously low voltage locations have been dramatically improved. Vertical green bars show the activity of the ENGO units to optimize voltage at the point of the problem.

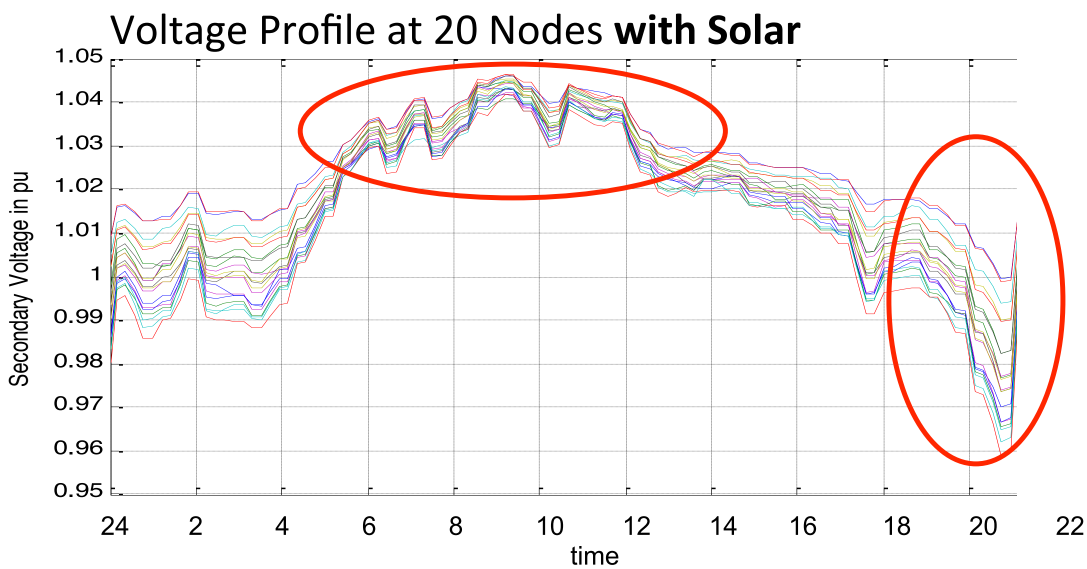


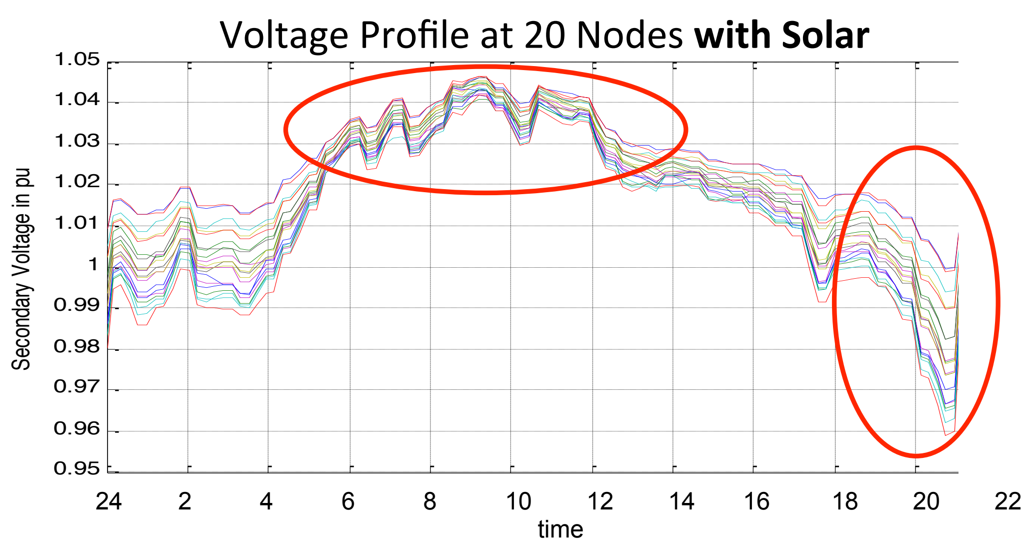
The following chart displays similarly improved voltage conditions along a distribution feeder line with grid edge control deployed.

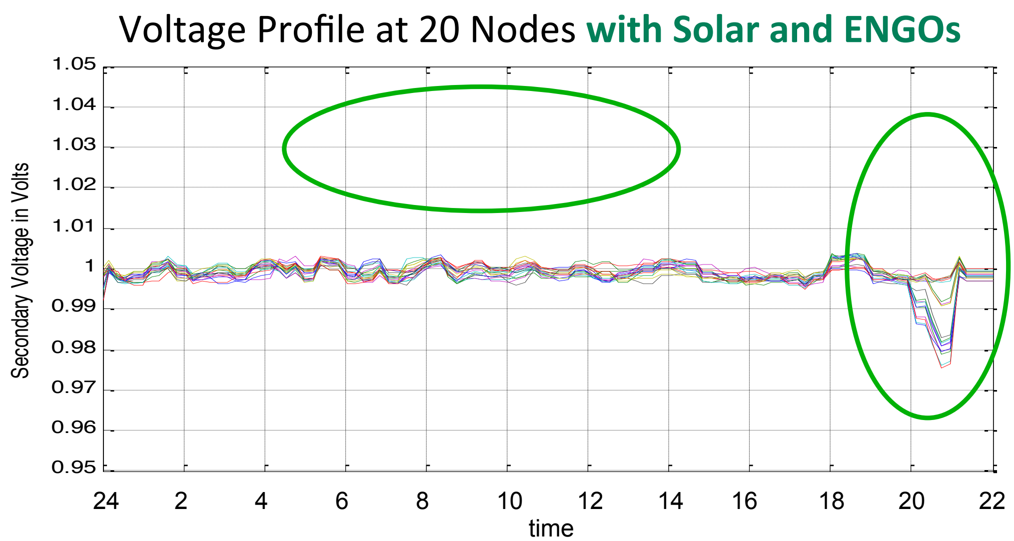


The orange and red plots of the voltage are considerably improved at the right, creating consistent voltage all along the feeder, thus allowing a grid operator to lower the voltage to achieve system efficiencies and energy conservation, for a peak event or for long term continuous energy concervation (CVR), even in the presence of significant PV solar systems (and their associated intermittent voltage issues).

4. Solar and Voltage Optimization: The following charts demonstrate that solar deployed along a feeder line can contribute to situations of over-voltage, in addition to traditional challenges of low voltage at the end of the feeder circuit. Again, voltage control technologies have been demonstrated to address both issues quickly and effectively.






Voltage Profile at 20 Nodes with Solar and ENGOs
Secondary Voltage in Volts
1.05
1.04
1.03
1.02
1.01
1
0.99
0.98
0.97
0.96
0.95
24
2
4
6
8
10
12
14
16
18
20
22
time